A critical appraisal of "Intermittent Blood Flow Restriction Does Not Reduce Atrophy Following Anterior Cruciate Ligament Reconstruction."

By

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Abstract

The purpose of this critical appraisal is to examine "Intermittent Blood Flow Restriction Does Not Reduce Atrophy Following Anterior Cruciate Ligament Reconstruction" in order to determine its relevance and application for physical therapists. This appraisal will include a critique on the authors question, research design and methodologies, results, and discussion. This critical appraisal will explain research process and provide a background into the importance of this research article, while highlighting limitations and weaknesses of the study. This is important in order to determine the clinical relevance of this article and the application of the findings for Physical Therapists.

Key words

Within this study key words are ACL reconstruction, vascular occlusion, and Quadriceps atrophy.

Introduction

Anterior Cruciate Ligament (ACL) reconstruction is a very popular injury among athletes. Reduction is quadriceps size and strength is often reported with recovery from ACL reconstruction due to immobilization, unloading, and inability to utilize the quadriceps. It can be difficult to regain quadricep size and strength after ACL reconstruction, so it would be beneficial to reduce the amount of atrophy immediately after ACL reconstruction in order to return to activities faster. Occlusion stimulus has been shown to reduce the amount of atrophy in quadriceps post ACL reconstruction. Studies have shown the benefit of using occlusion stimulus for five minutes, followed by a removal of stimulus for three minutes, two times per day. This specific study looked at the effects of this protocol on a specific population of athletes, which to the authors knowledge had not been studied before. The purpose of this appraisal is to examine

the effects of occlusion stimulus training on quadricep atrophy after ACL reconstruction. This is important in order to provide Physical Therapists with evidence for the use of occlusion stimulus training.

Methods

My first step was to pick a database that would cover a multitude of studies. I was not sure what type of research was present on my specific topic, so I wanted to choose a database that would serve as a "catch all." This led me to choose PubMed, because of the vastness of the database. Key words used to find this article were blood-flow restriction, quadriceps, and ACL. The major limitation I applied was the date of publication. I did not want any study older than ten years in order to have updated research, so I adjusted the dates accordingly. The main inclusion I wanted was specific to the quadriceps. There was a lot of research on occlusion stimulus training, but I specifically wanted to hone in on the quadriceps muscle. I initially anticipated at least ten hits, but with my limitations there were 34 relevant articles that fit my criteria. After examining the articles and ruling out anything that was not an actual study I was able to find a credible study. Upon finding a credible study I refined my research by viewing the citations of that study, which lead to this article.

This study was published by the Journal of Sport and Health Science in 2016. The authors are Erik Iversen, Vibeke Rostad, and Arne Larmo. This study was conducted in Norway, but peer reviewed by Shanghai University of Sport. This study has major Physical Therapy implications. It is important to acknowledge research that is contradictory to what is typically seen. Specifically, for ACL recovery a major issue is atrophy of the quadriceps muscles. This impacts the patient greatly and a major role of the Physical Therapist is to decrease the amount of atrophy post-surgery. It is therefore essential for the Physical Therapist to be up-to-date with

relevant research on how to best utilize the time with the patient with interventions that are evidence based to aid in their recovery process. This study in particular is important, because it showed no major significance for the use of occlusion therapy to limit atrophy. This suggest that it would be beneficial for the Physical Therapist to utilize other means to treat their patients'. I chose this study because it is relatively credible. First, the subjects were randomly assigned and were split into two groups that consisted of a control group. Second, the participants had similar backgrounds in that they were all athletes. Lastly, the instruments and measures used were credible. Examining the cross-sectional area of the muscle using axial magnetic resonance is a very credible way to examine muscle atrophy. For these reasons, and more, I chose this article for a comprehensive critical appraisal.

Results

Summary of the study

The purpose of this study was to determine the effects of an occlusion stimulus on quadricep atrophy following anterior cruciate ligament (ACL) reconstruction. Previous studies demonstrated success in limiting quadricep atrophy after ACL reconstruction. This study examined the effects of occlusion stimulus (restricted blood flow therapy) on 24 subjects. The subjects were randomly assigned to two groups (7 male, 5 female) the occlusion group and the exercise only group. The exercise only group served as the control for this study. Two days post-surgery the occlusion group received the occlusion stimulus for five minutes, followed by a removal of the occlusion for three minutes. This protocol was repeated five times for one training session and there were two training sessions per day. The participants performed 20 repetitions of a low load for a total of 100 reps per training session. The control group followed the same exercise protocol, but without the occlusion stimulus. Changes in the cross-sectional area of the

quadriceps were measured with axial magnetic resonance at 40% and 50% of the length of the femur. The results of this study showed no significant difference in the occlusion group versus the control groups in regards to atrophy of the quadricep muscles. The conclusion of this study suggests it is contradictory to previous studies, which showed restricted blood flow therapy decreased muscle atrophy in the quadriceps.

Appraisal of the study introduction

This research article went into depth in the background and provided relevant research to justify the execution of this study. The in-depth background provided strength to this article and the authors

The authors did not address a loading protocol in the introduction. There was adequate information provided on the occlusion stimulus and justification for the use of occlusion stimulus, but there was no information given on what exercises to be administered.

Appraisal of the study methods

The researchers randomly assigned the participants into two groups and the radiologist taking the cross-sectional measurements was blind to the groups. This provided strength to the research. Each participant came from an athletic background, which addressed the primary question for this research.

A major weakness of this article is the vagueness of the exercise prescription. The authors did not specifically state how many repetitions, sets of each exercise, or the time parameter for exercise progression. This limits the ability for this study to be replicated. Another weakness in this study is the authors did not use individual adjustments of the restrictive cuff pressure for each subject and the size of the cuff was larger than previous studies, which could

have affected the occlusion. The type of imaging done was not the best way to determine muscle atrophy. Instead, the authors should have used muscle volume instead of ACSA measurements.

Appraisal of the study results

The authors clearly stated the results of the study, which showed no significant difference between the two groups. The authors used appropriate statistical analysis for this study and presented the data well, providing strength to the article.

The only statistical analysis done for this study was a comparison between changes in groups using a parametric unpaired t-test. While this statistical analysis was appropriate for this study the authors could have added to this study by measuring quadricep atrophy in other ways. This would have provided more strength to the article.

Appraisal of the study discussion

The discussion is very well written and addresses other research articles that contradicted the findings of this study. The authors explained the limitations of this study and pointed out areas that could have been improved. The discussion addresses the whole picture and explains their findings well.

The authors could had addressed their limitations in more detail. They pointed out that the intensity of the exercises was a limitation, but failed to acknowledge the vagueness of the exercise prescription.

Discussion

This study has major clinical implications. It is important to acknowledge research that is contradictory to what is typically seen. Specifically, for ACL recovery a major issue is atrophy of the quadriceps muscles. This impacts the patient greatly and a major role of the Physical

Therapist is to decrease the amount of atrophy post-surgery. It is therefore essential for the Physical Therapist to be up-to-date with relevant research on how to best utilize the time with the patient with interventions that are evidence based to aid in their recovery process. This study in particular is important, because it showed no major significance for the use of occlusion therapy to limit atrophy. This suggest that it would be beneficial for the Physical Therapist to utilize other means to treat their patient.

This study needs to be taken in with the context of what previous studies have demonstrated. Multiple studies have shown the benefits of occlusion stimulus for reducing quadricep atrophy. Upon analyzing the methodology for this study there are a couple of limiting factors that explain their results, which have previously been addressed. So, a Physical Therapist should not base their interventions from this study alone. A benefit of using an intervention based on this study is that you could possibly still get some benefit from using occlusion stimulus. There were a few subjects who had less quadricep atrophy, compared to the control. A potential risk is that a patient would waste precious time toward the beginning of their recovery. This would incumber their recovery process, because other, more productive, interventions could have been implemented. A major improvement for this intervention is using a different sized cuff, which would facilitate the occlusion stimulus more. Another improvement would be changing the exercise intensity.

There is not enough evidence from this study to base a clinical application from. If this study did not contradict a larger amount of studies, than this could be used as a clinical application. Unfortunately, there is a pool of research which goes against the results of this study, which suggests this study is not reliable. Therefore, I could not implement an intervention based of off this study alone, because it contradicts a larger pool of research.

The purpose of this study was to determine the effects of occlusion stimulus on quadricep atrophy after a ACL reconstruction. Twenty four subjects participated in this study, which found there was no difference between occlusion stimulus and non-occlusion stimulus for reducing atrophy in the quadriceps. The results of this study contradicted a large amount of similar studies, which could be due to a few limitation of this study. More research needs to be conducted to truly understand the effects of occlusion stimulus on reducing quadricep atrophy after an ACL reconstruction.